

03/15/00

03-17-00

jc525 U.S. PTO
09/525564
03/15/00Assistant Commissioner for Patents
Patent Application
Washington, D.C. 20231

Submitted herewith for filing is the

- ☒ patent application of
☐ continuation application of
☐ continuation-in-part patent application of

- ☐ divisional application of
☐ prior application information: Examiner _____
☐ _____

Inventor(s)/Applicant Identifier: **FIERO, Richard A.**For: **Human-Device Physical Interface**

- ☐ For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can be relied upon when a portion has been inadvertently omitted from the submitted application parts.
- ☐ This application claims priority from each of the following Application Nos./filing dates: _____, the disclosure(s) of which is (are) incorporated by reference.
- ☐ Please amend this application by adding the following before the first sentence: "This application is a ☐ continuation ☐ continuation-in-part of and claims the benefit of U.S. Application No. _____, the disclosure of which is incorporated by reference for all purposes."

Enclosed are:

16 pages of the description (including specification, claims and abstract)
2 sheet(s) of ☒ formal ☐ informal drawing(s)
21 number of claims
an assignment of the invention to _____
a ☒ signed ☐ unsigned Declaration
a Power of Attorney
a certified copy of a _____ application
cover sheet
Information Disclosure Statement under 37 CFR 1.97
Preliminary amendment
Application data entry sheet

- ☐ a petition to extend time to respond in the parent application
☐ notification of change of ☐ power of attorney ☐ correspondence address filed in prior application
☒ Patent Application Filing Acknowledgement postcard
☒ 1 extra copy of this sheet is enclosed
☒ a verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27
(X) is enclosed
() was filed in the prior application and small entity status is still proper and desired

	(Col. 1)	(Col. 2)
FOR:	NO. FILED	NO. EXTRA
BASIC FEE		
TOTAL CLAIMS	21- 20	= 1
INDEP CLAIMS	3- 3	= *0
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENTED		

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
	\$345.00	OR		\$690.00
x \$ 9.00 =	\$ 9.00	OR	x \$18.00 =	\$
x \$39.00 =	0	OR	x \$78.00 =	\$0.00
+ \$130.00 =	0	OR	+ \$260.00 =	
TOTAL	345.00	OR	TOTAL	\$

Please charge Deposit Account No. 50-0893 as follows:

- ☒ Filing fee. \$ 354.00
☒ Any additional fees associated with this paper or during the pendency of this application.
☐ The issue fee set in 37 CFR 1.18 at or before mailing of the Notice of Allowance, pursuant to 37 CFR 1.311(b).

Respectfully submitted,

Christopher C. Sappenfield
Christopher C. Sappenfield
Reg. No.: 45,073
Attorney for Applicant

CORRESPONDENCE ADDRESS:

LAW OFFICES OF JONATHAN ALAN QUINE

P.O. Box 458

Alameda, CA 94501

Telephone: (510) 337-7871

Fax: (510) 337-7877

Customer No. 22798



22798

PATENT TRADEMARK OFFICE

Attorney Docket No. 15-000100US

Express Mail Label No. EL328700332US

Date of Deposit: March 15, 2000

I hereby certify that this is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above, addressed to: Assistant Commissioner for Patents Washington, Box Patent Application, D.C. 20231

By:

Andrew Merit
Andrew Merit

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c)) - SMALL BUSINESS CONCERN

Applicant or Patentee: FIERO, Richard A.Application or Patent No.: (not yet known)Filed or Issued: (filed herewith on March 15, 2000)Title: Human-Device Physical Interface

I hereby declare that I am:



the owner of the small business concern identified below:



an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Small Business Concern: R A Fiero AssociatesAddress of Small Business Concern: 63 Almenar Drive, Greenbrae, CA 94904 USA

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled **Human-Device Physical Interface** by inventor(s) **FIERO, Richard A.**, described in:



the specification filed herewith.

Application No. , filed .Patent No. , issued .

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern that would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Name
Address

☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization
Name
Address

☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Person Signing: Richard A. FieroTitle of Person if Other than Owner: Address of Person Signing: 63 Almenar Drive, Greenbrae, CA 94904 USA

Signature

Richard A. Fiero

Date

07-15-00

Inventor Information

Inventor One Given Name:: Richard A.
Family Name:: Fiero
Postal Address Line One:: 63 Almenar Drive
City:: Greenbrae
State or Province:: CA
Country:: US
Postal or Zip Code:: 94904
Citizenship Country:: US

Correspondence Information

Correspondence Customer Number:: 22798
E-mail:: jaquine@quinelaw.com

Application Information

Title Line One:: Human-Device Physical Interface
Title Line Two::
Total Drawing Sheets:: 2
Formal Drawings?: Yes
Application Type:: Utility
Docket Number:: 15-000100US

Representative Information

Representative Customer Number:: 22798

PATENT APPLICATION

Human-Device Physical Interface

Inventor(s): Richard A. Fiero, a citizen of the United States, residing at 63 Almenar Drive, Greenbrae, California 94904.

Entity: Small

As Filed: Wednesday, March 15, 2000

Correspondence Address:

THE LAW OFFICES OF JONATHAN ALAN QUINE	
P.O. Box 458	Phone: (510) 337-7871
Alameda, CA 94501	Fax: (510) 337-7877
Internet address: www.quinelaw.com	Email: jaquine@quinelaw.com

Human-Device Physical Interface

COPYRIGHT NOTIFICATION

5 Pursuant to 37 C.F.R. 1.71(e), Applicants note that a portion of this disclosure contains material which is subject to copyright protection. The copyright owner has no objection to the facsimile reproduction by anyone of the patent document or patent disclosure, as it appears in the Patent and Trademark Office patent file or records, but otherwise reserves all copyright rights whatsoever.

BACKGROUND OF THE INVENTION

10 Current portable electronic devices, such as cellular telephones, personal digital assistants, radios, and the like have been designed and manufactured in ways that limit a user's interface with the devices. These devices frequently include housings with output display screens positioned above input keypads during intended usage. Single-
15 handed operation of a device with this configuration generally forces a user to hold the device with its center of gravity less than securely placed, if at all, within the hand. This lack of functional optimization makes one-handed operation difficult. These disadvantages are significant, because often a user has only a single hand available to engage the device due to a brief case, package, steering wheel, or other article occupying
20 the other hand. For example, between establishing a communication link and communicating, the device is typically manipulated in the hand in order to switch between these tasks since the keys or other input mechanisms are not optimally disposed for operation by one hand.

25 The layout of existing portable electronic devices also contributes to repetitive stress injuries and other stress-related problems. Manipulation of many existing hand-held devices, especially during one-handed operation, produces awkward movements that cause stress on, e.g., the wrist, hand, and fingers. This is frequently due to balancing or otherwise holding the device at or near one end and stretching or constricting the thumb and/or fingers while attempting to engage the device. Aside from

personal injury, this mode of holding and operating these devices makes it more likely that they will be dropped and damaged.

Hand-held devices which are optimized for communications and which include display screens below a set of input keys which provide for 10 digit or complete alphanumeric information input are not available. It would also be desirable to have portable electronic devices that are more directly configured for one-handed operation.

SUMMARY OF THE INVENTION

The present invention provides various portable electronic devices and methods related thereto. The devices generally include a housing that includes a front surface and a back surface. The front surface typically includes an upper region and a lower region. The devices also optionally include an input keypad in or proximal to the upper region. The input keypad typically includes input keys for inputting, e.g., each number in a ten digit system. Additionally, the devices optionally include a display screen in or proximal to the lower region. The display screen provides an output, e.g., for at least one or more numbers inputted from the input keypad or for stored or received data.

The components of the portable electronic devices of the present invention include various orientations relative to each other. For example, the display screen, the input keypad, or both, are optionally adjustably rotated relative to the housing, e.g., by a user. The housing, the display screen, and the input keypad each include at least one relative orientational axis in which the relative orientational axes are optionally substantially parallel or substantially non-parallel. Alternatively, the relative orientational axes of the display screen and the input keypad are substantially parallel, while an angle formed between the relative orientational axis of the display screen and the relative orientational axis of the housing is greater than zero. Each relative orientational axis optionally includes one or more distance, such as a length, a width, a base, a height, a non-diagonal length, or the like.

The components of the devices of the present invention also optionally include assorted shapes. For example, the front or the back surface of the housing is optionally formed in a shape that includes a regular n-sided polygon, an irregular n-sided polygon, a triangle, a square, a rectangle, a trapezoid, a circle, an oval, or the like. An

external surface of the display screen and of the input keypad similarly each individually optionally include a shape independently selected from, e.g., a regular n-sided polygon, an irregular n-sided polygon, a triangle, a square, a rectangle, a trapezoid, a circle, an oval, or the like.

5 The display screen of the invention typically displays, e.g., textual information, graphical information, video information, or combinations thereof. The display screen also optionally includes, e.g., the input keypad on an upper region of the screen, in which the input keypad is a graphical screen keypad.

10 The input keypad and the input keys include various configurations. For example, the input keys of the input keypad optionally include at least one symbol disposed thereon. Furthermore, a portion of at least one of the input keys of the input keypad is optionally elevated or depressed relative to the front surface. The input keypad also optionally includes a graphical screen keypad or a virtual keypad. Alternatively, the input keypad also includes, e.g., at least 10 input keys. Optionally, the input keypad
15 includes less than 10 input keys, in which at least some of the input keys are pressed more than once or in which multiple input keys are pressed simultaneously. The input keypad optionally also includes additional input keys, e.g., for inputting letters from an alphabet or commands represented by abstract insignia disposed on the additional input keys. The input keys of the present invention are also optionally utilized for partial or
20 complete alphanumeric entry, e.g., of the 10 digits of a standard numeric system and for some or all of the letters of a given alphabet, such as the English, German, Japanese, Chinese, Spanish, or other alphabets.

 The portable electronic device of the present invention optionally includes, e.g., a telephone, a telephone headset, a cellular phone, a cordless telephone, a cordless
25 telephone headset, a calculator, a computer, an electronic organizer, a personal information manager, a personal digital assistant, a television, a global positioning device, a paging device, a radio, a CB radio, a short-wave radio, or the like. The devices also optionally include additional elements, such as a microphone, a speaker, an antenna, and the like.

30 In certain embodiments, a portion of the front surface is optionally movable relative to the back surface, or a portion of the back surface is optionally

movable relative to the front surface. Additionally, at least one dimension of the device is optionally capable of at least one dimensional change, e.g., telescoping or folding a portion of the device in at least one dimension.

The present invention also includes methods of manufacturing a portable electronic device. The method typically includes forming a housing, a display screen, and input keys using one or more fabrication technique, in which the housing includes a front surface and a back surface, and in which the front surface includes an upper region and a lower region. The methods also include assembling the display screen and the input keypad in or on the front surface such that the input keys are disposed in or proximal to the upper region and the display screen is disposed in or proximal to the lower region. The input keys are optionally assembled in or on the front surface into an input keypad that includes, e.g., input keys for each number in a 10 digit system. The input keys are also optionally utilized for partial or complete entry of some or all of the letters of a given alphabet. The fabrication technique(s) selected to manufacture the device components optionally include, e.g., injection molding, compression molding, cast molding, die cutting, laser cutting, or the like. Additionally, the method includes assembling the display screen and the input keypad in or on the housing such that either or both is/are optionally adjustably rotated relative to the housing.

The present invention also includes a method of using a portable electronic device. The method includes holding the device in at least one hand of a user and positioning the device proximal to a head of the user. Thereafter, the user optionally engages the device by viewing the display screen, operating the input keypad with at least one finger on the hand, listening to sounds produced by a speaker disposed in the device, speaking into a microphone disposed in the device, or by performing a simultaneous or non-simultaneous combination of these steps.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1A shows a frontal view of a wireless communication device embodiment that includes an input keypad disposed above a display screen in which both the keypad and the screen are oriented for right-handed use.

Figure 1B shows the device of Figure 1A from a side view.

Figure 1C depicts the device of Figure 1A in the hand of a user.

Figure 1D shows a frontal view of a wireless communication device embodiment that includes an input keypad disposed above a display screen in which both the keypad and the screen are oriented neutrally for use by either hand.

Figure 2 provides a frontal three-dimensional view of the device of Figure

5 1.

DETAILED DISCUSSION OF THE INVENTION

The present invention provides improved portable or hand-held electronic devices, and methods related thereto, that include interfaces which enable users to operate the devices with greater effectiveness, with less physical stress, and with less risk of damage to the devices. The invention generally includes components, such as a keypad or other input mechanism that is positioned above an output or display screen in a front surface of a device housing. The keypad and/or the display screen is/are optionally oriented more directly for right- or left-handed usage or neutrally for usage by either hand. The keypad and/or the display screen is/are also optionally adjustably rotatable.

15 The component configurations of the invention provide various advantages over existing comparable devices especially during one-handed operation. For example, the input keys on an input keypad are more easily accessed and engaged by, e.g., a user's thumb, while the device is securely held, than with existing devices. Secure handling of the device during operation also decreases the probability that the device will be dropped or otherwise damaged. The input keypad orientation also provides for less stress on the hand and fingers of the user when engaging the keys. Furthermore, since the configuration provides for less distracting usage, it also leads to greater safety when simultaneously performing other tasks, e.g., operating a motor vehicle or the like.

20 In certain preferred embodiments, such as a wireless communication device (e.g., a cellular phone, etc.), the display screen is optionally viewable simultaneous with other device operations, e.g., speaking into a microphone, listening to a speaker, engaging an input key, or the like. Figures 1 and 2 show wireless communication device 100 of the present invention from various perspectives. As shown, the device typically includes housing 102 that includes a front surface and a back surface. The front surface includes an upper region and a lower region. In the embodiment depicted, the device also includes input keypad 106 in or proximal to the

upper region. The input keypad typically includes input keys **108** for entering data. Alternative input components, such as graphical input interfaces are discussed below. Additional input is optionally received (and output sent) by, e.g., antenna **112**. (FIG. 1). The devices also include display screen **104** (e.g., an optical display screen) in or proximal to the lower region for providing at least one form of output. Note, that although wireless communication device **100** illustrated in Figures 1A, 1B, 1C and 2 is configured primarily for right-handed use, it will be appreciated that the devices of the present invention can also be readily configured for predominantly left-handed use by, e.g., rotating input keypad **106** and/or display screen **104** clockwise about 90° from the orientations shown. As shown in Figure 1D, wireless communication device **100** is also optionally configured neutrally for use by either hand.

In general, device dimensions (e.g., housing proportions, relative component size, or the like) are dependent on the size and flexibility of the human hand and fingers. The devices of the present invention are configured to be securely held and operated by one hand with relative ease. This typically includes the entire input keypad being accessible to the thumb of the operating hand.

Devices, such as wireless communication device **100**, configured with input keys **108** disposed above display screen **104** provide many advantages over comparable existing devices. As mentioned, these advantages include allowing easier and more convenient display screen **104** viewing during other simultaneous device operations, e.g., listening to speaker **114**, speaking into microphone **110**, engaging input keys **108**, using other operational keys **116**, or the like. This mode of operation generally affords less interruption, e.g., when conversing and responding to voice-mail or similar prompts, while referencing information on display screen **104** at the same time. This configuration also reduces the likelihood that the device will be dropped, e.g., during operation, as the device is held more completely in the palm of the hand in order to engage input keys **108**, relative to devices that have keypads disposed below displays. See e.g., Figure 1C.

Aside from input keypad **106** being placed above display screen **104** in the portable electronic devices of the invention, these components also optionally include various orientations relative to each other or to housing **102**. (FIGS. 1 and 2). Although

not shown, in one embodiment of the invention display screen **104** and/or input keypad **106** are/is optionally capable of being adjustably rotated by a user relative to housing **102** and to various internal components (e.g., printed circuit boards, electronic components, etc.). Alternatively, the internal components or portions thereof in addition to display screen **104** and/or input keypad **106** are/is capable of adjustable rotation relative to housing **102**. Optionally, adjustable rotation is accomplished by manual adjustment or by automated adjustment (e.g., actuating at least one internal drive motor operably connected to each component).

Housing **102**, display screen **104**, and input keypad **106** each include at least one relative orientational axis. (FIGS. 1 and 2). As used herein, the term “relative orientational axis” describes the orientation of device components, namely, the screen, the keypad, and the device housing, relative to one another; each of which optionally includes various shape permutations. As mentioned, the front or the back surface of housing **102** is optionally formed in a shape that includes a regular n-sided polygon, an irregular n-sided polygon, a triangle, a square, a rectangle, a trapezoid, a circle, an oval, or the like. Similarly, an external surface of display screen **104** and of input keypad **106** each individually typically include a shape independently selected from, e.g., a regular n-sided polygon, an irregular n-sided polygon, a triangle, a square, a rectangle, a trapezoid, a circle, an oval, or the like.

The meaning of relative orientational axis is further illustrated by referring to Figure 1A. In a preferred embodiment depicted therein, the external surfaces of both input keypad **106** and display screen **104** are shaped as squares and the relative orientational axes of the two components are the lengths of the squares which, in this case, are substantially parallel. As shown, the front surface of housing **102** is shaped approximately as a rectangle. In turn, the relative orientational axis of housing **102** includes a length or a width of the rectangle, which in this case form an angle with the relative orientational axis (i.e., the length) of display screen **104** that is greater than zero (e.g., about 1°, 5°, 15°, 30°, 45°, 60°, or the like). Optionally, the relative orientational axes of display screen **104**, input keypad **106**, and/or housing **102** are substantially parallel or substantially non-parallel to one another. By analogy, the term “relative

orientational axis” can be applied to other shape variations possible for display screen 104, input keypad 106, and housing 102.

As indicated in a preferred embodiment depicted in Figure 1C, the angled orientation of the keypad and the display screen offer significant advantages relative to conventional devices. One advantage is that these devices are more suited for ergonomic usage. The thumb of a user can readily engage the input keys with less stressful movements. Similarly, the angled display screens of the devices of the present invention are more amenable to being viewed, e.g., at the same time a user is listening to output from a speaker.

The display screen of the invention is used to display various forms of output. The output optionally includes, e.g., textual information, video information, graphical information, or combinations thereof. The display screen also optionally includes a graphical screen keypad, e.g., on an upper region of the screen. Many display screens suitable for use in the present invention are known to those of skill including, e.g., cathode-ray tubes (CRTs), liquid-crystal displays (LCDs), digital displays, light-emitting diodes (LEDs), luminescent lamps, crystalline semiconductor diodes, video display terminals (VDTs), monitors, or the like.

A housing of a device also defines an interior space within which various electronic components are mounted on one or more printed circuit boards or other functionally equivalent substrates (e.g., flexible plastic sheets or the like). The particular electronic components vary according to the application for which the device is designed. However, the components are generally operably connected to the input and output components. Power is optionally supplied to the various device components from an internal or an external source. An internal source typically includes a battery or other source (e.g., a miniature gas powered fuel cell, etc.). The devices also optionally include a connection port for external power sources. Suitable electronic components and power sources appropriate for specific applications are well-known in the art.

The input keypad or keyboard and the input keys optionally include various arrangements or manifestations. For example, an input key typically includes one or more symbols disposed thereon, such as numbers, letters, abstract insignia, or the like, which represent information to be input into the device. Optionally, a portion of the input

keys of the input keypad are elevated or depressed (i.e., angled, textured, slanted, rounded, etc.) relative to the front surface of the housing. The input keypad also optionally includes a graphical screen keypad, a virtual keypad, a touch-sensitive screen, or other graphical user interface (GUI) that enables a user to input information through the use of symbols, pointing devices, visual metaphors, handwritten character recognition, or the like.

Alternately, the input keypad includes 10 or more input keys (e.g., one key for each number in a 10 digit system, or more keys for additional command or information input), or less than 10 input keys in which at least some of the input keys are engaged in multiple ways to input different information. For example, data or other information is optionally entered by simultaneously engaging multiple keys (e.g., 2, 3, 4 or more). Furthermore, various combinations of key engagements are also optionally included to input alphanumeric or other information. Multifunctional keys are also alternatively included in input keypads that include 10 or more keys. Other keys (e.g., minimal, toggle, roller, etc.), switches (e.g., on/off switches, display screen lighting switches, etc.), dials, or the like are also typically disposed on a front, a side or other surface of a device for scrolling, pointing, adjusting (e.g., volume, tone, picture or screen quality, etc.), transmitting, sending, receiving, or the like. The devices of the present invention also optionally incorporate digital signal processors (DSPs) for the recognition and interpretation of speech input. Input keypads suitable for use in the present invention are generally well-known.

Aside from keys for entering numerical information, additional input keys are also optionally included for partial or complete alphanumeric entry, e.g., of the 10 digits of a standard numeric system and for some or all of the letters of a given alphabet, such as the English, German, Japanese, Chinese, Spanish, or other alphabets. As mentioned above, input keys are also optionally included for entering commands represented by abstract insignia disposed on the input keys. Many different arrangements or configurations of input keypads and input keys appropriate for the present invention are possible.

As mentioned, a portion of the front surface is optionally movable relative to the back surface, or a portion of the back surface is movable relative to the front

surface. In these embodiments, keypads, display screens, and/or other components are optionally included in the movable portions. Additionally, at least one dimension of the device is optionally capable of at least one dimensional change, e.g., telescoping or folding a portion of the device in at least one dimension for more convenient device storage.

There are many different devices to which the component orientations of the present invention can be applied. Some of these devices include, e.g., a telephone, a telephone headset, a cellular phone (a particularly relevant and preferred embodiment), a cordless telephone, a cordless telephone headset, a calculator, a computer (e.g., a palm top computer, etc.), an electronic organizer, a personal information manager (e.g., a personal digital assistant, etc.), a television, a global positioning device, a paging device, a radio, a CB radio, a short-wave radio, or the like.

The invention also includes methods of manufacturing portable electronic devices with the component configurations described above. The methods optionally include forming a housing, a display screen, and input keys using one or more fabrication technique, in which the housing includes a front surface and a back surface, and in which the front surface includes an upper region and a lower region. The methods further include assembling the display screen and the input keypad in or on the front surface such that the input keys are disposed in or proximal to the upper region and the display screen is disposed in or proximal to the lower region. The input keys are typically assembled in or on the front surface into an input keypad that includes, e.g., input keys for each number in a 10 digit system, some or all letters of various alphabets, or other arrangements as described above. The fabrication technique(s) selected to manufacture the device components are generally well-known and include, e.g., injection molding, compression molding, cast molding, or the like. Components, such as housings are alternatively cut from substantially planar materials (e.g., plastic sheets, metal sheets, etc.) and folded or otherwise formed in the desired shape utilizing various well-known fabrication techniques including, e.g., die cutting, laser cutting, or the like. The methods also optionally include assembling the display screen and the input keypad in or on the housing such that either or both adjustably rotate relative to the housing.

The portable electronic devices of the present invention are typically operated by one hand. The thumb of the operating hand generally extends across a portion of the front surface of the device while the heel of the palm and the fingers clamp the device in the user's hand. The thumb is generally capable of readily engaging the input keypad even while the device is positioned proximal to a head of the user. The user typically engages the device by viewing the display screen, operating the input keypad with at least one finger on the hand (e.g., the thumb), listening to one or more sound produced by a speaker disposed in the device, speaking into a microphone disposed in the device, or by performing a simultaneous or non-simultaneous combination of these steps.

While the foregoing invention has been described in some detail for purposes of clarity and understanding, it will be clear to one skilled in the art from a reading of this disclosure that various changes in form and detail can be made without departing from the true scope of the invention. For example, all the techniques and apparatus described above may be used in various combinations. All publications and patent documents cited in this application are incorporated by reference in their entirety for all purposes to the same extent as if each individual publication or patent document were individually so denoted.

WHAT IS CLAIMED IS:

1. A portable electronic device, comprising:
a housing comprising a front surface and a back surface, the front surface
5 comprising an upper region and a lower region;
an input keypad in or proximal to the upper region, the input keypad comprising
input keys for inputting each number in a ten digit system; and,
a display screen in or proximal to the lower region, the display screen providing
an output for at least one or more numbers inputted from the input keypad or for stored or
10 received data.
2. The portable electronic device of claim 1, wherein the display screen,
the input keypad, or both, can be adjustably rotated relative to the housing.
3. The portable electronic device of claim 1, wherein the housing, the
display screen, and the input keypad each comprise at least one relative orientational axis,
15 wherein the relative orientational axes are substantially parallel.
4. The portable electronic device of claim 1, wherein the housing, the
display screen, and the input keypad each comprise at least one relative orientational axis,
wherein the relative orientational axes are substantially non-parallel.
5. The portable electronic device of claim 1, wherein the housing, the
20 display screen, and the input keypad each comprise at least one relative orientational axis,
wherein the relative orientational axes of the display screen and the input keypad are
substantially parallel, and wherein an angle formed between the relative orientational axis
of the display screen and the relative orientational axis of the housing is greater than zero.
6. The portable electronic device of claim 1, wherein the housing, the
25 display screen, and the input keypad each comprise at least one relative orientational axis,
wherein each relative orientational axis comprises one or more distance selected from the
group consisting of: a length, a width, a base, a height, and a non-diagonal length.

7. The portable electronic device of claim 1, wherein the front or the back surface of the housing forms at least one shape selected from the group consisting of: a regular n-sided polygon, an irregular n-sided polygon, a triangle, a square, a rectangle, a trapezoid, a circle, and an oval.

5 8. The portable electronic device of claim 1, wherein an external surface of the display screen and of the input keypad individually comprise at least one shape independently selected from the group consisting of: a regular n-sided polygon, an irregular n-sided polygon, a triangle, a square, a rectangle, a trapezoid, a circle, and an oval.

10 9. The portable electronic device of claim 1, wherein the display screen displays textual information, graphical information, or video information, or combinations thereof, or,

wherein the display screen comprises the input keypad on an upper region thereof, wherein the input keypad is a graphical screen keypad.

15 10. The portable electronic device of claim 1, wherein one or more of the input keys of the input keypad comprises at least one symbol disposed thereon; or,

wherein the input keypad is a graphical screen keypad or a virtual keypad; or,

wherein the input keypad comprises at least 10 input keys; or,

20 wherein the input keypad comprises less than 10 input keys, wherein at least some of the input keys are pressed more than once or wherein multiple input keys are pressed simultaneously.

11. The portable electronic device of claim 1, the input keypad further comprising additional input keys for inputting letters from an alphabet or commands represented by abstract insignia disposed on the additional input keys.

25 12. The portable electronic device of claim 1, wherein at least a portion of at least one of the input keys of the input keypad is elevated or depressed relative to the front surface.

13. The portable electronic device of claim 1, wherein the device comprises one or more of: a telephone, a telephone headset, a cellular phone, a cordless telephone, a cordless telephone headset, a calculator, a computer, an electronic organizer, a personal information manager, a personal digital assistant, a television, a global positioning device, a paging device, a radio, a CB radio, or a short-wave radio.

14. The portable electronic device of claim 1, wherein the device comprises additional elements comprising: a microphone, a speaker, or an antenna.

15. The portable electronic device of claim 1, wherein a portion of the front surface is movable relative to the back surface; or,
wherein a portion of the back surface is movable relative to the front surface.

16. The portable electronic device of claim 1, wherein at least one dimension of the device is capable of at least one dimensional change.

17. The portable electronic device of claim 16, wherein the at least one dimensional change comprises telescoping or folding a portion of the device in at least one dimension.

18. A method of manufacturing a portable electronic device, the method comprising:

forming a housing, a display screen, and input keys using one or more fabrication technique, wherein the housing comprises a front surface and a back surface, and wherein the front surface comprises an upper region and a lower region; and,

assembling the display screen and the input keypad in or on the front surface such that the input keys are disposed in or proximal to the upper region and the display screen is disposed in or proximal to the lower region, wherein the input keys are assembled in or on the front surface into an input keypad comprising input keys for each number in a 10 digit system.

19. The method of claim 18, wherein the one or more fabrication technique comprises one or more of: injection molding, compression molding, cast molding, die cutting, or laser cutting.

20. The method of claim 18, comprising assembling the display screen and the input keypad in or on the housing such that either or both can be adjustably rotated relative to the housing.

21. A method of using a portable electronic device, the method
5 comprising:
holding the device of claim 1 in at least one hand of a user; and,
positioning the device proximal to a head of the user, wherein the user engages
the device by viewing the display screen, operating the input keypad with at least one
finger on the at least one hand, listening to sounds produced by at least one speaker
10 disposed in the device, speaking into at least one microphone disposed in the device, or
by performing a simultaneous or non-simultaneous combination thereof.

HUMAN-DEVICE PHYSICAL INTERFACE

ABSTRACT OF THE DISCLOSURE

Portable electronic devices including housings in which input keypads are

- 5 disposed above display screens and in which input keypads and/or display screens are optionally directly oriented for one-handed operation are provided. Devices including input keypads and/or display screens that are adjustably rotatable relative to device housings are also provided. Methods of manufacturing and using these portable electronic devices are additionally provided.

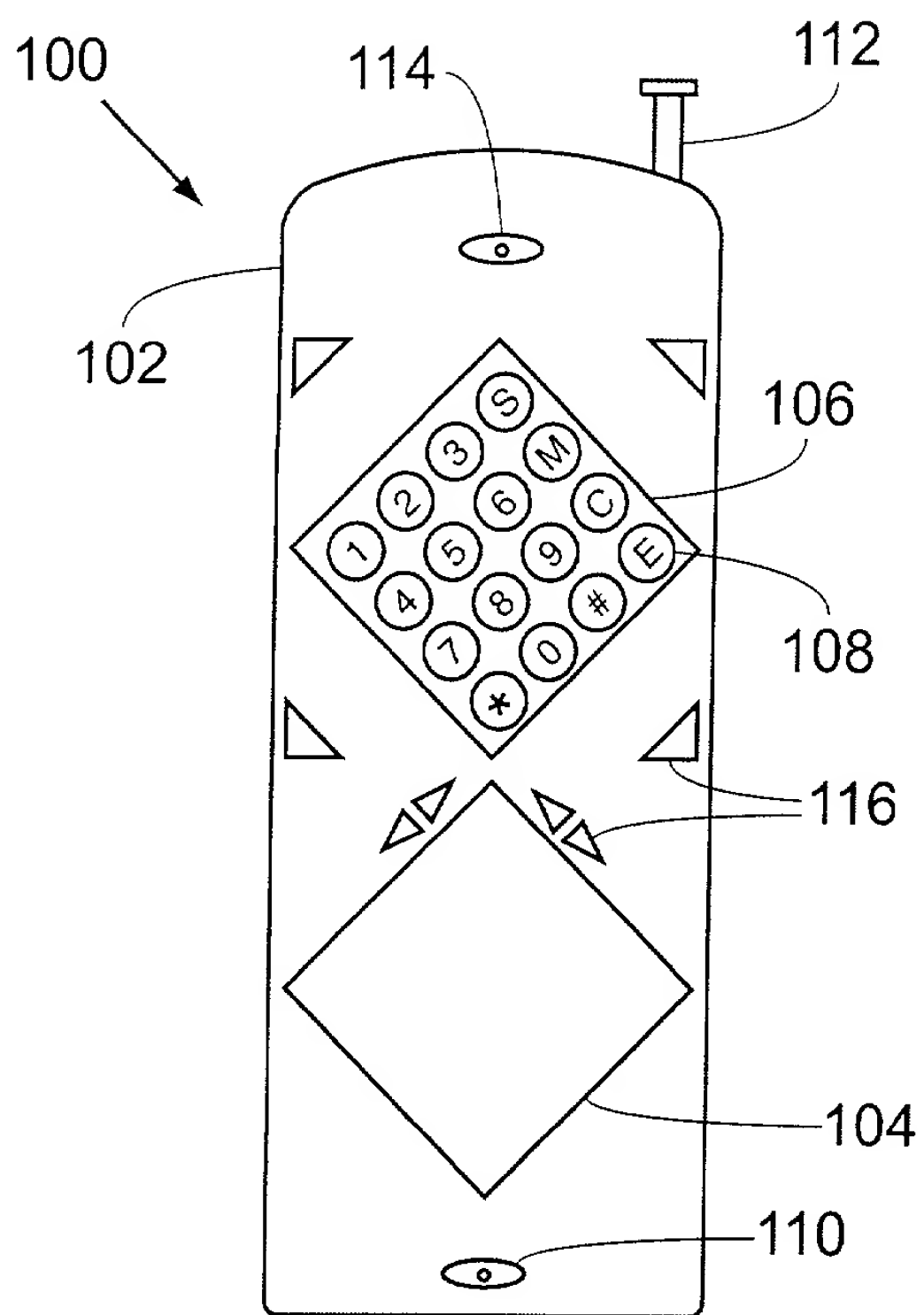


Fig. 1A

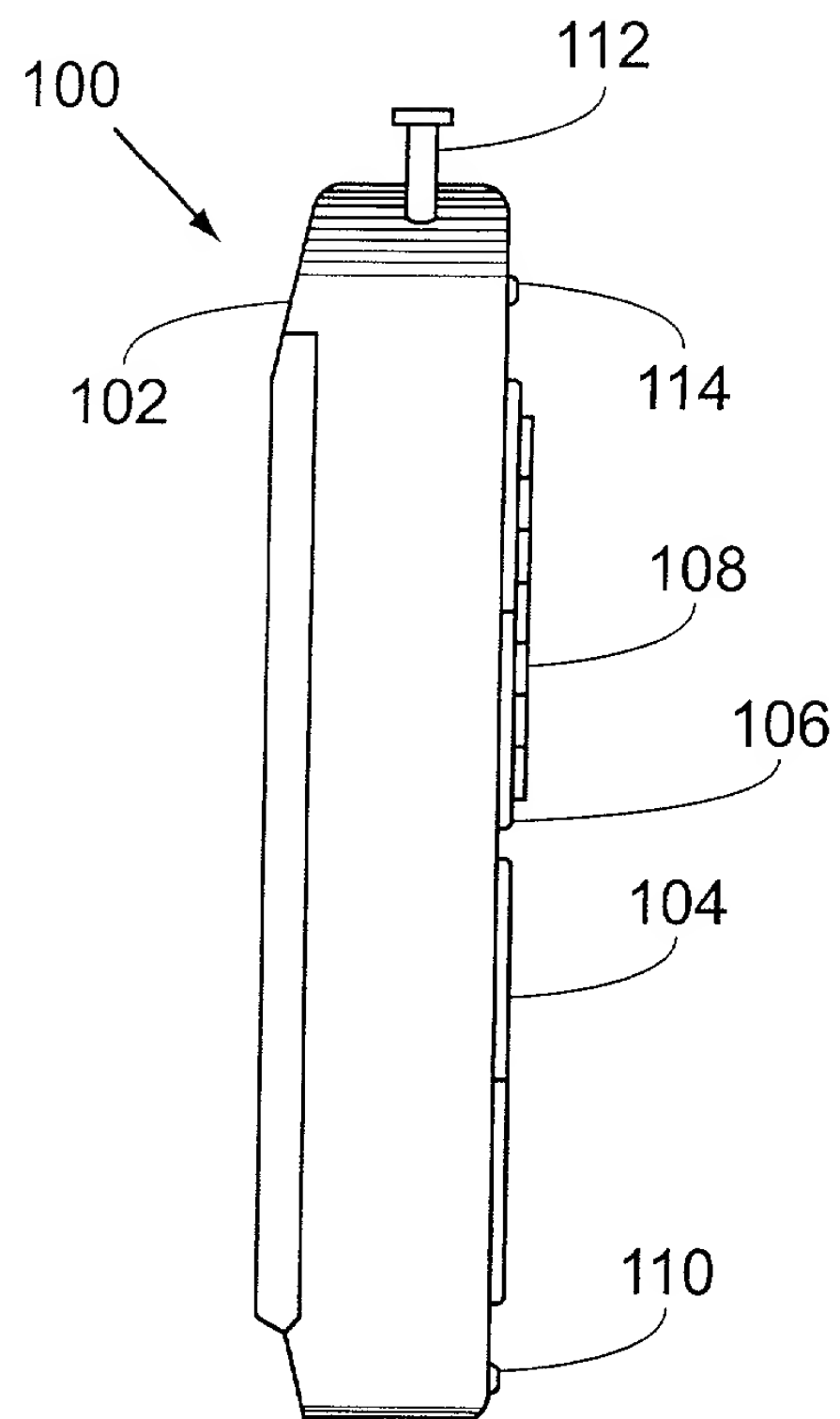


Fig. 1B

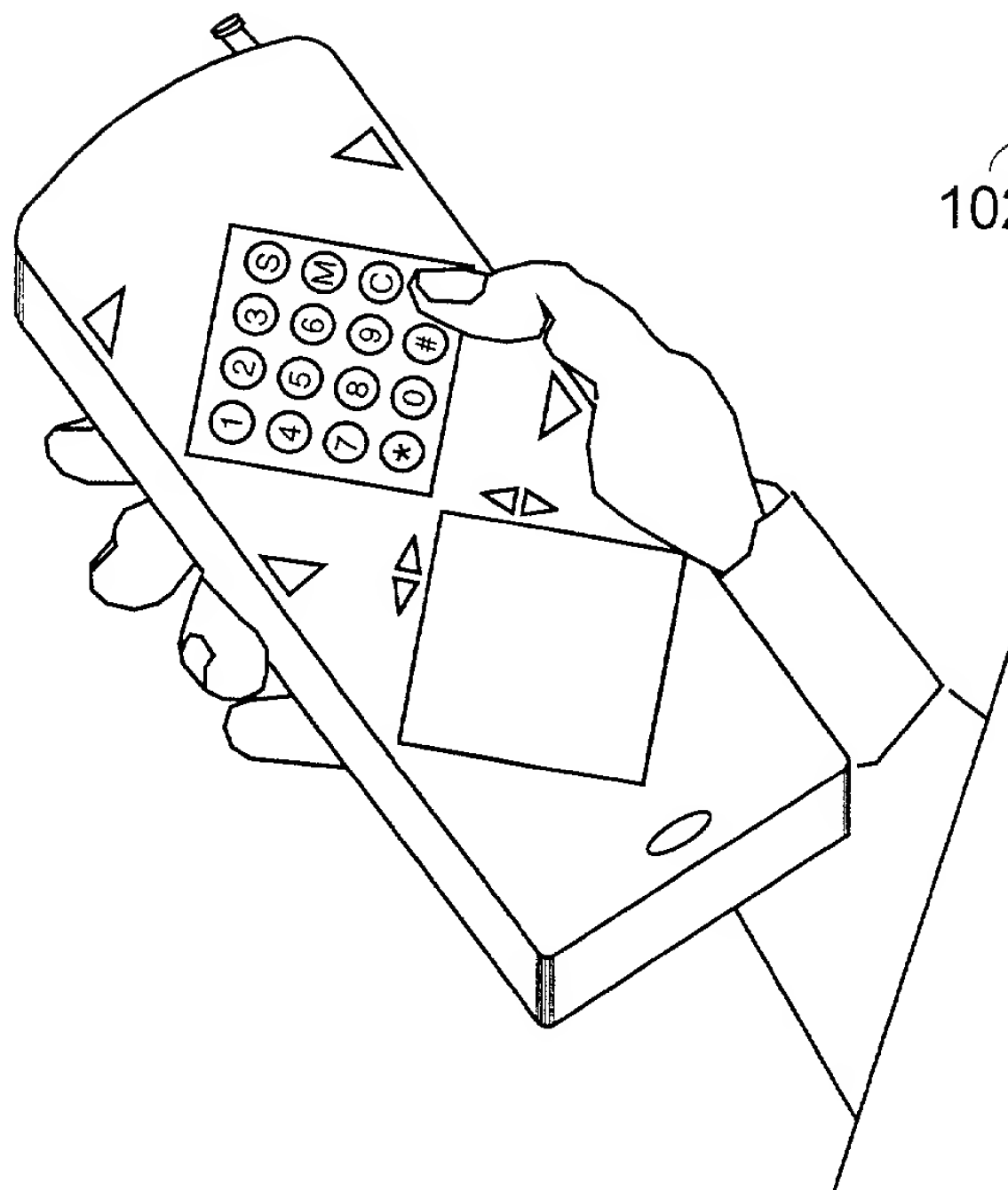


Fig. 1C

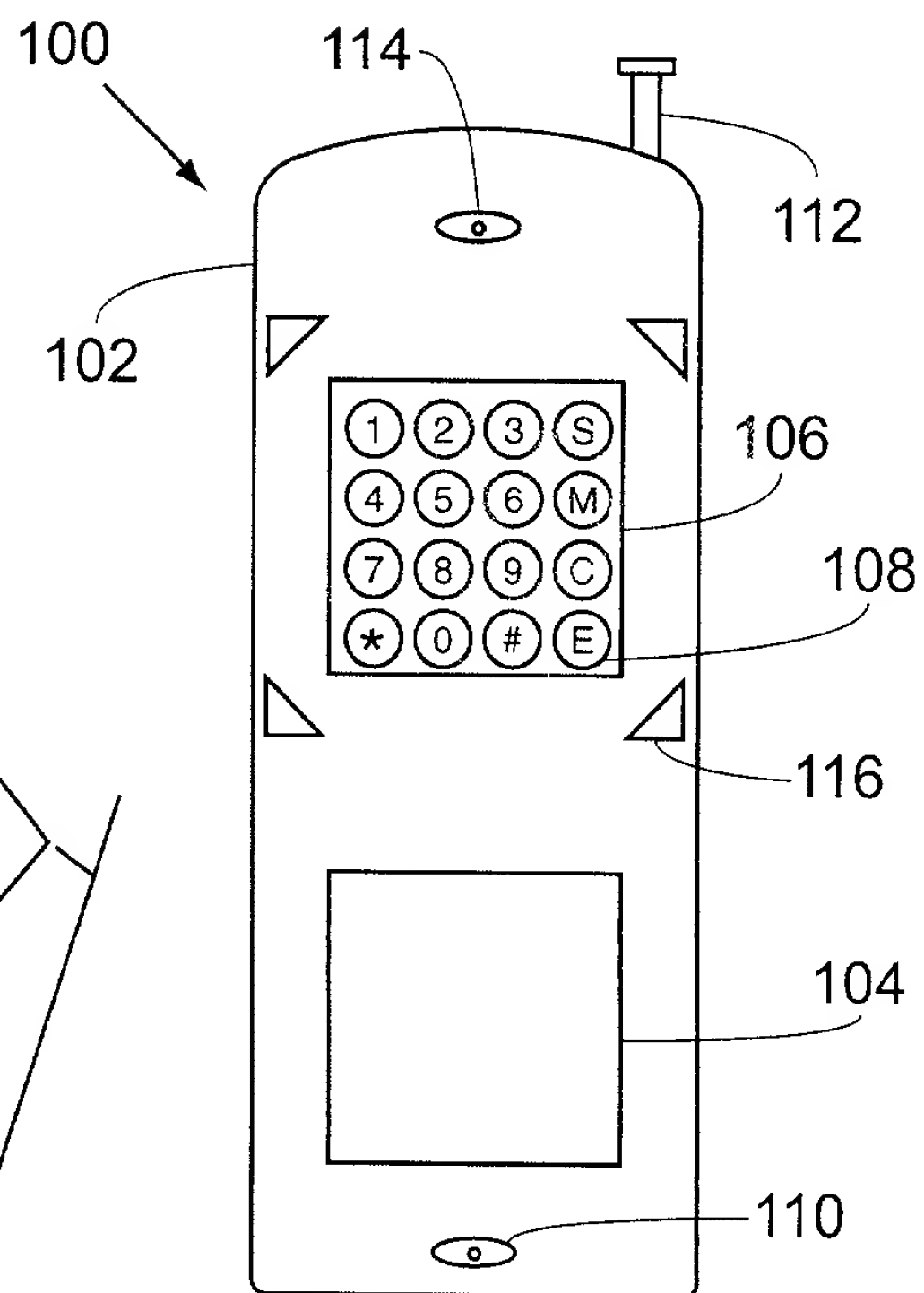


Fig. 1D

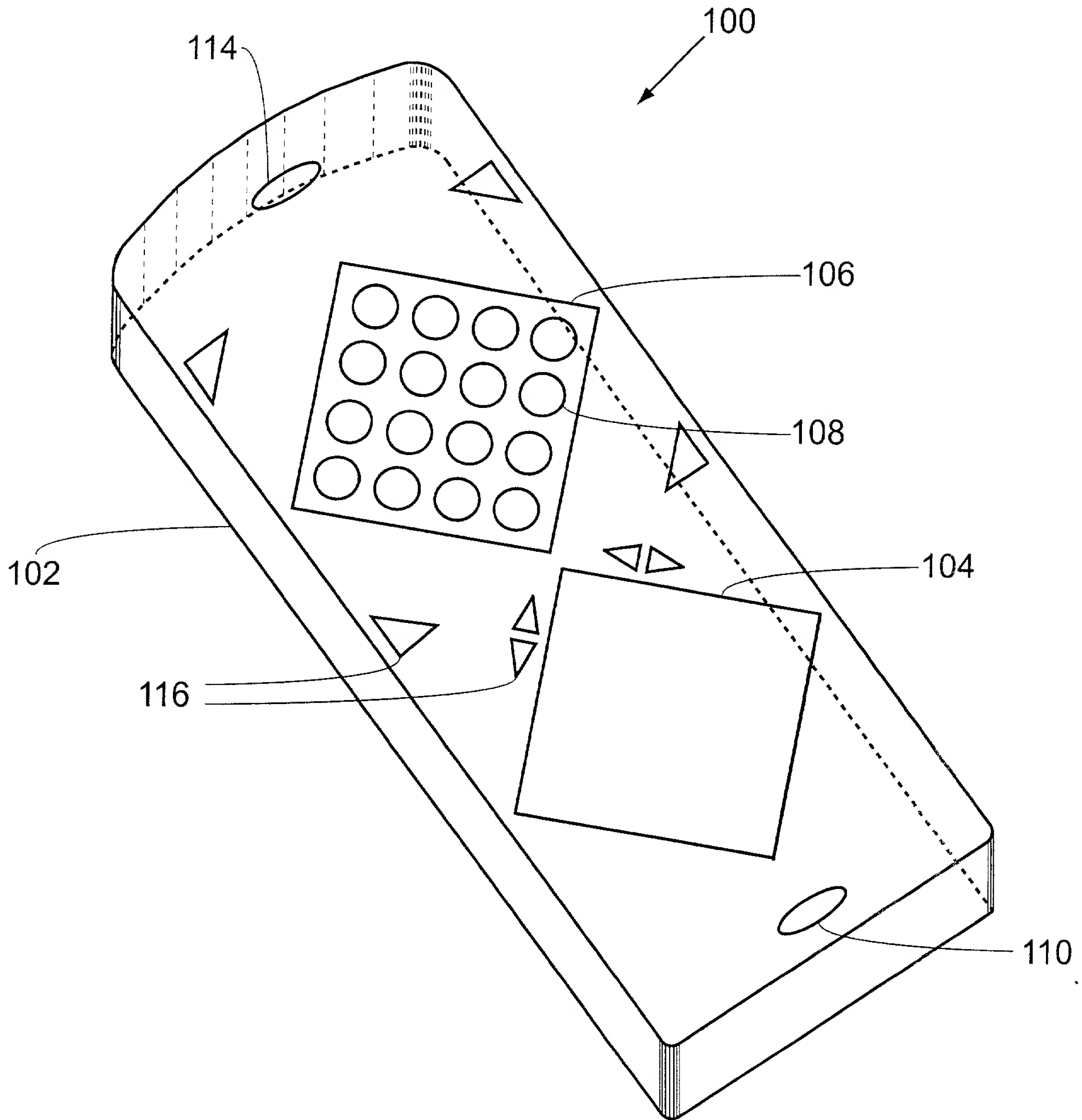


Fig. 2

DECLARATION

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **Human-Device Physical Interface** the specification of which X is attached hereto or was filed on as Application No. , and was amended on (if applicable).

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56. I claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Foreign Application(s)

Country	Application No.	Date of Filing	Priority Claimed Under 35 USC 119

by claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

Application No.	Filing Date

I claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application No.	Date of Filing	Status

Full Name of Inventor 1:	Full Name: Fiero, Richard A.		
Residence & Citizenship:	City: Greenbrae	State/Foreign Country: California/United States	Country of Citizenship: United States
Post Office Address:	Post Office Address: 63 Almenar Drive, Greenbrae, California 94904 United States		
Full Name of Inventor 2:			
Residence & Citizenship:	City:	State/Foreign Country:	Country of Citizenship:
Post Office Address:	Post Office Address:		
Full Name of Inventor 3:	Full Name:		
Residence & Citizenship:	City:	State/Foreign Country:	Country of Citizenship:
Post Office Address:	Post Office Address:		

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor 1 <u>Richard A. Fiero</u> Richard A. Fiero Date 03-15-00	Signature of Inventor 2 _____ Date	Signature of Inventor 3 _____ Date
---	--	--

ation.doc

POWER OF ATTORNEY OR AUTHORIZATION OF AGENT ACCOMPANYING APPLICATION	Application Number	(not yet known)
	Filing Date	March 15, 2000
	First Named Inventor	Fiero, Richard A.
	Group Art Unit	Unassigned
	Examiner Name	Unassigned
	Attorney Docket Number	15-000100US

PTO
09/15/00
03/15/00

I hereby appoint:

☒ Practitioners at Customer Number 22798
Type Customer Number Here

OR

Practitioner(s) named below:

Name	Registration Number



as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the Patent and Trademark Office connected therewith.

Please designate the correspondence address for the above-identified application to:

☒ The above-mentioned Customer Number.

THAT IS:

Firm or Individual Name	Law Offices of Jonathan Alan Quine				
Address	2033 Clement Ave., Suite 200				
Address					
City	Alameda	State	CA	Zip	94501
Country	United States				
Telephone	(510) 337-7871	Fax	(510) 337-7877		

I am the

☒ Applicant.

☐ Assignee of record of the entire interest (*Certificate under 37 CFR 3.73(b) is enclosed*)

SIGNATURE of Applicant or Assignee of Record

Name	Richard A. Fiero
Signature	<i>Richard A. Fiero</i>
Date	03.15.00

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States as first class mail in an envelope addressed to:
Assistant Commissioner for Patents, Box Patent Application, Washington, D.C. 20231 on this date: _____

Typed or printed name			
Signature		Date	